

The Labor Occupational Health Program has a library with a special VDT collection regarding health issues of computer usage.

- National Association of Working Women (9 to 5), 1224 Huron Rd., Cleveland OH 44115, Phone: (800) 522-0925, or (216) 566-9308.

Toll-free number is their Job Problem Hotline. Fact Sheet on fluorescent lights and health.

- Your local electrical utility company.

Many electrical utilities now offer a basic EMF testing service for free, measuring ELF magnetic fields (power line radiation) inside and outside your home. They generally do not make recommendations for EMF reduction or assessment as to what readings are potentially harmful.

- United States Department of Energy, Bonneville Power Administration, P.O. Box 3621, Portland OR 97208-3621, Phone: (800) 622-4519 or (503) 230-3478.

Federal government agency with informative booklets: Electrical Power Lines —Questions and Answers on Research into Health Effects and Electrical and Biological Effects of Transmission Lines — A Review.

- Check your local phone directory's yellow pages under Environmental and Ecological Services for other EMF testing services.
- International Institute for Baubiologie and Ecology, Inc., P.O. Box 387, Clearwater FL 34615, Phone: (813) 461-4371.

Headquarters for their German Building Biology correspondence course dealing with EMF and chemical factors in the home related to health.


- TCO Information Center, 150 N. Michigan Ave., Suite 1200, Chicago IL 60601-7594, Phone: (312) 781-6223, Fax: (312) 346-0683.

The United States affiliate of the TCO labor union in Sweden. They have informative booklets about ergonomic and EMF factors involved in computer work: Screen Checker and Screen Facts. Free information about Sweden's MPR2 and TCO computer radiation standards. United States

newsletter begun in 1995; first issue had two articles regarding ES and computers.

- SWEDAC, Box 878, S-50115, Boras Sweden, Phone: +46-8 613 4002, Fax: +46-8 613 4003.

Swedish Board for Technical Accreditation has technical publications dealing with Sweden's MPR2 standards for computer monitors.

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- Check with your library for a list of magnetic shielding manufacturers in the books Thomas Register of American Manufacturers, Products and Services Section, Shielding: Magnetic.
  - TCO, The Swedish Confederation of Professional Employees, S-11494, Stockholm, Sweden, Phone: +46 8 782 9100, Fax: + 46 8 782 92 07.

Headquarters for the TCO labor union. Further information regarding TCO computer radiation standards available.

## APPENDIX

### Computer Radiation Standards

There are no mandatory United States non-ionizing radiation standards for computer monitors other than the Federal Communication Commission's (FCC) approval for radio frequency interference suppression. The Radiation Control for Health and Safety Act of 1968 required television sets, another cathode ray tube screen, to reduce ionizing radiation — primarily reducing x-ray emissions. In the 1960's some television sets were emitting significant levels of x-rays and were recalled.<sup>96</sup>

Unfortunately, the Radiation Control for Health and Safety Act of 1968 has not been revised to include non-ionizing radiation from electrical appliances. The standard old-fashioned phrase is that there is no established link between power line radiation or other lower frequency fields and health hazards. But the anecdotal accounts of health hazards are worldwide.<sup>2, 12, 22, 41</sup> A United States Department of Energy booklet reports that power line (60 Hz) radiation effected the following biological *changes* in the laboratory: changes in tumor development, white blood cell counts, animals' behavior, human heart rate, human brain activity, cell and tissue function, biorhythms, growth, etc. Additionally, animals could detect and sought to avoid strong electric (E-field) exposure.<sup>128</sup>

Historically, many studies show biological effects. Science debates whether these biological effects are hazardous. Some studies showed no effect to counter other studies where the effect seemed clear. Admitting health hazards from EMFs would be costly both in the face of needed changes in technology and also regarding prior liability for injuries.

So anecdotal accounts are being largely ignored by science, in favor of scientific studies of EMFs, funded by computer manufacturers, electrical utilities, other industry groups, etc. Needless to say, there is a question of potential conflict of interest in the cases where those who have the most to lose are searching for the truth about EMF health hazards.

Sweden has voluntary technology-based radiation standards for computer monitors. Their standards, called MPR2, require reduction of the primary emissions, ELF and VLF fields, based upon what is easy for industry to do at little additional cost. MPR2 is not designed to be health-based standards, because "safe" EMF levels have not been scientifically determined.<sup>21</sup> Sweden's white collar labor union called TCO objected to MPR2 standards, saying that they are not safe enough. Now TCO has their own standards, based upon the limits of present technology.<sup>121</sup> Their intention is that computer radiation be "as low as technically feasible". TCO mentions oversensitivity to electricity, skin problems, cancer and birth defects among their published concerns of computer radiation exposure based upon their group's experience.<sup>120</sup> (See MPR2 and TCO Standards, page 81.)

The ES patient's illness is beyond the TCO standards' helpfulness. The ES person usually cannot use a computer at all, even if shielded. Using equipment that is emitting EMFs, just weakens the ES patient's condition further in the long-term.

If you were to call the United States computer manufacturers and ask about MPR2 and TCO, the phone representatives may not know about either one. If their monitors meet MPR2, generally the representatives will know about it, and otherwise they usually do not. Even representatives at the major computer manufacturers do not generally know about TCO standards, even though Sweden's labor union now has an office in Chicago and is actively seeking all computer manufacturers to meet their radiation standards. Many United States computer manufacturers now meet Sweden's MPR2 standards and a few meet TCO standards for one computer monitor in their product line.

School districts would do well to specifically ask for MPR2 or TCO standards on all new equipment. Ideally, you would want emission measurements of all MPR2 component fields to determine by how much their monitor is below those standards. New computer monitors going into school systems are not necessarily meeting MPR2 standards; you would need to ask for it or measure for it to be sure of having lower-radiation monitors. Older monitors ideally would be replaced or upgraded to reduce

computer radiation.<sup>64</sup>

Sweden's computer radiation guidelines are the strictest in the world. In 1991, Sweden's MPR2 guidelines took effect in Sweden, which primarily reduces the ELF and VLF frequencies from computer monitors.

ELF and VLF fields have two components — electric and magnetic fields. The electric fields are easier to reduce than the magnetic ones. Anti-radiation glare screens can significantly reduce these electric fields at the front of the monitor. Glare screen manufacturers sometimes claim that their screen blocks 98% or more of ELF/VLF radiation — but this is only the electric component (the E-Field).

The magnetic field (the H-Field) part of ELF/VLF requires a nickel/iron alloy like Mumetal to reduce these magnetic fields — the ELF magnetic field is the one currently of most concern. However, the VLF magnetic field has more energy to induce electric current and is limited by MPR2 standards also.

Glare screens with a conductive coating and grounding wire are helpful to reduce the alternating current E-field (electric field) and static electricity from the screen, but do not reduce the H-field (magnetic field) emissions. Grounded metal around the computer monitor may help reduce static and E and H field emissions, depending upon the magnetic field shielding quality of the metal. Nickel/iron alloys can offer good reduction, but at higher cost. Other metals used for magnetic shielding in general include iron, low-carbon steel, iron mixed with aluminum, silicon, and/or cobalt, etc.

Grounding refers to transferring the E-field out into the building's electrical grounding system which takes the current to the earth. Grounding is not about magnetic field reduction. Metal shielding that is highly magnetically permeable is most effective for magnetic field reduction.

Computer radiation has various levels of exposure depending upon the equipment in operation. For example, if the screen is shut off, but the CPU (central processing unit) is still on, ELF radiation emissions are occurring from the CPU. The only sure way of eliminating the computer radiation exposure is by unplugging the computer monitor and

all related equipment. When a monitor is on but not in use — a common office practice — computer radiation exposure occurs. Some newer monitors have a power-down feature to limit energy use and EMFs when in the on, but inactive, mode.

However, the most serious radiation exposure occurs when the computer is actually in use. Then, there is more radiation and more intense radiation than when the computer is on but inactive. An ES patient can sometimes feel the pulses of radiation with each keystroke of the computer. A critical question is whether current Swedish standards take account of these increased fields when someone is operating the keyboard. If they currently do not, higher readings and/or more frequencies of EMFs could be accounted for by retesting for MPR2 or TCO standards with a typist using the computer to simulate actual user exposures.

### Sweden's voluntary computer radiation guidelines

The TCO labor union's standards below are an attempt to bring EMF emissions to the lowest measurable level based on current technology.

	<u>MPR2</u>	<u>TCO</u>
- X-rays (measurable)	0	0
- Electrostatic potential (static electricity)	less than or equal to 500 volts	less than or equal to 500 volts
- Alternating electric field Band I (ELF) * 5 Hertz - 2 kilohertz	less than or equal to 25 volts per meter, measured at 50 centimeters (19.7 inches) in front of the computer monitor	less than or equal to 10 volts per meter, measured at 30 centimeters (11.8 inches) in front of the computer monitor.
- Alternating electric field Band II (VLF) ** 2 kilohertz - 400 kilohertz	less than or equal to 2.5 volts per meter, measured 50 centimeters (19.7 inches) around the computer monitor.	less than or equal to 1 volt per meter, measured at 50 centimeters (19.7 inches) around the computer monitor and at 30 centimeters (11.8 inches) in front of the computer monitor (single point)
- Magnetic field Band I (ELF) *5 Hertz - 2 kilohertz	less than or equal to 2.5 milligauss measured at 50 centimeters (19.7 inches) around the computer monitor	less than or equal to 2 milligauss measured to 50 centimeters (19.7 inches) around the computer monitor and at 30 centimeters (11.8 inches) in front of the computer monitor (single point)
- Magnetic field Band II (VLF)** 2 kilohertz - 400 kilohertz	less than or equal to .25 milligauss, measured at 50 centimeters (19.7 inches) around the computer monitor	less than or equal to .25 milligauss, measured at 50 centimeters (19.7 inches) around the computer monitor

\* ELF = extremely low frequency

\*\* VLF = very low frequency

Source: TCO Information Center, 150 N. Michigan Avenue, Suite 1200, Chicago, IL 60601-7594 Phone: (312) 781-6223<sup>121</sup>

**Magnetic Field Readings from Common Home Appliances****(ELF Frequency Readings) \***

at 12 inches from the source

	<u>Reading</u>
Microwave Oven	40 - 80 mG*
Clothes Washer	2 - 30 mG
Electric Range	4 - 40 mG
Electric Shaver	1 - 90 mG
Fluorescent Lamp	5 - 20 mG
Hair Dryer	1 - 70 mG
Television	.4 - 20 mG

The microwave oven, fluorescent lamp, and the television also use higher frequencies. The clothes washer, electric range, hair dryer, and electric shaver may measure readings in the very low frequency (VLF) range as well as ELF due to harmonics.

\* mG = milligauss; readings above 2 mG are suspected of being related to increased cancer rates. Fields below 2 mG are detectable by many ES patients.

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Source: United States Department of Energy<sup>127</sup>



**Electric and Magnetic Field Readings  
from United States High-Voltage Power Lines  
(ELF Frequency Readings)**

<u>Electric Field*</u>	<u>115 kV</u>	<u>230 kV</u>	<u>500 kV</u>
Maximum Reading on Right-of-Way	1.0	2.0	7.0
Distance from lines:			
50 feet (edge of Right-of-Way)	.5	1.5	-
65 feet (edge of Right-of-Way)	-	-	3.0
100 feet	.07	.3	1.0
200 feet	.01	.05	.3
<u>Magnetic Field**:</u>			
Maximum Reading on Right-of-Way			
Average	30	58	87
Peak	63	118	183
Distance from lines:			
50 feet (average/peak)	7/14	20/40	-
65 feet	-	-	30/62
100 feet			
Average	2	7	13
Peak	4	15	27
200 feet			
Average	.4	2	3
Peak	1	4	7

\* in kilovolts per meter = kV/m

\*\* in milligauss = mG. Readings above 2 mG have been related to higher cancer rates.

Source: United States Department of Energy<sup>127</sup>

### Environmental Illness at the Worksite

Time and place are important determinants of environmental health symptoms. If symptoms intensify at a specific place or time during the day suspect environmental factors.

- Do symptoms abate away from the worksite (evenings, weekends, vacations)?
- Is your computer workstation ergonomically designed? Health problems at the computer need to be sorted out as to whether environmental or ergonomic factors are causing the problem — or perhaps both.
- Do symptoms occur just being at work, before work or during breaks? Indoor air quality may be poor and creating a Sick Building Syndrome problem.

Working in an office environment easily becomes impossible when a person is ES. Computer monitors, which now seem to be everywhere, are among the worst EMF offenders. Electric typewriters, laser printers, copy machines, and fax machines are other common office EMF sources.

ES people are in desperate need of assistance from the Americans with Disabilities Act, Social Security disability, Vocational Rehabilitation and other assistance programs that help the disabled, either to cope with a restructured job or be awarded disability income when no accommodations can be made and other options are not possible.

In the workplace — where much environmental illness begins — most workers are unable to change their environment without support from their employers.

If you suspect that you are having the early signs of an environmental illness from workplace chemical or electromagnetic exposures, *do not* merely try to adapt to the toxin/stressor. This quiet acceptance of the problem is how many MCS and ES problems began and developed into literally intolerable physical nightmares. Instead, speak to your supervisor about your concerns, perhaps also the personnel department or other employee grievance vehicles, such as your labor union representative. Other angles may involve the early guidance of a worker's compensation lawyer and a medical doctor knowledgeable in environmental medicine to back up your claims.

A period of leave from work may be necessary to see whether your condition improves, while the employer assesses and hopefully corrects the worksite health hazard. A trial return to work medically monitored could lead to the cause and effect connection between the workplace and your recurring symptoms for worker's compensation, Social Security disability, or other benefits.

Quitting your job to avoid the problem and trying to find another type of job while still unwell is not usually a good idea and relieves responsibility from the employer who damaged your health and reduced your ability to maintain your career and normal standard of living. However, staying at a worksite that makes you ill is unacceptable and should be reported to management. Correcting the problem, relocating you, or allowing you a leave of absence while the matter is being investigated would be appropriate to diminish further liability on the part of the employer, while not risking your health further.

#### **Points to Consider for EMF Reduction in the Workplace**

1. Measurement of worksite EMF — requires an ELF gaussmeter or an EMF testing service. (See EMF Resources, page 74.)
  - Record EMF measurements and note their location.
  - What is "background" EMF at the center of the room with equipment shut off?
  - Attempt to determine the exact source of each reading. Remember, ELF magnetic fields penetrate walls. Turning off all power at the electrical circuit box will determine whether outside power lines are producing a reading indoors.
  - Most inexpensive gaussmeters will only measure one direction of the field at a time. To find the highest reading, turn the meter horizontal, vertical, and sideways to the EMF source. A triple-axis meter will measure the three dimensions at once for one combined milligauss reading.
  - If an EMF reading is high at a wall with all appliances unplugged on both

sides of the wall and outside power lines are not the contributing factor, an electrician who understands EMFs may need to be called to check building wiring.

- What are EMF readings of office equipment at operator distances?
  - In areas reporting EMFs greater than 2mG, can work areas be removed to lower EMF areas?
2. Call monitor manufacturers — do workplace monitors meet MPR2 standards? If not, you could consider EMF reductions to present monitors or replacing old monitors with newer, lower-radiation MPR2 or TCO models. Reduction equipment would consist of a Mumetal type alloy for ELF and VLF magnetic field reduction, and a grounded glare screen attachment with a conductive coating to reduce ELF/VLF electric fields and static at the screen.
  3. Are computer monitors spaced generously apart from one another, particularly if they do not meet MPR2.
  4. Are workers spaced at a comfortable distance from their monitor? A distance of about two feet from the screen is helpful for reducing EMF exposures, but may not be comfortable for the user. Software that enlarges letter size and a keyboard drawer help increase the distance between the screen and user.
  5. Clearing extra equipment (printers, fax machines, etc.) from your desk further reduces EMF exposure. Place the equipment on another table away from the immediate workstation area.
  6. Turning off all computer equipment that is not actively being used reduces unnecessary EMF exposures when non-computer activities are involved.
  7. If central processing units (CPUs) are sitting beneath monitors at the workplace, two EMF sources are near the user. An extension cord for the CPU allows you to place the CPU on the floor away from the worker's feet. A monitor arm can then elevate the monitor to eye level as before.
  8. When shopping for new office equipment, measure the EMF first and compare

before you buy.

### A Note to EMF Scientists

Why are many EMF scientific studies not successfully repeatable by other experimenters?

EMFs are very pervasive. When working in a laboratory, many confounding variables are present which can affect experimental results.

For example, fluorescent lights come in various types: full-spectrum, daylight, energy-efficient, etc. Each type of light can affect organisms and cells differently.<sup>96</sup>

The electromagnetic fields of fluorescent lights, computers, refrigerators, all motorized equipment, and wall wiring affect ES patients, and therefore would affect life on the microscopic level. Computer monitors and television screens are among the most EMF-penetrative sources. Computers placed within two rooms of an experiment — upstairs, downstairs, or next door — could affect study results, even if meters show no reading. Of course, no reading only means the limits of the meter have been exhausted but not necessarily the sensitivity of cells. The most sophisticated EMF detection equipment can detect computer EMFs and the information it contains from outside the building.<sup>9, 34</sup>

ES patients can be sensitive to computer monitors through walls (magnetic field exposure) and refrigerator motors at 15-20 feet or more. Precautions for cell studies would need to take special precautions to remove all EMF emitters not involved in the study. Stray fields from power surges in the building also need to be recorded. Magnetic field levels of the earth at that destination would ideally be noted, as they may influence test results.<sup>40</sup>

Essentially, the testing site must be environmentally clean of stray EMF or chemical contaminants that could confound the study. Beyond shielding the room from external EMF sources, the equipment brought into the site is also EMF emitting and needs to be minimized. For example, electron microscopes kill the sample being studied. Dark-field microscopes do not.

Air quality of the room from a chemically sensitive person's perspective could be assessed. Chemicals from the construction materials of the room and the experimenters' clothing (soap/cologne/smoke, etc.) may change the experiment.

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